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THE PROGRESS OF PUBLIC WORKS IN THE PHILIPPINE ISLANDS.

*By James W. Beardsley, recently Director of Public Works
in the Philippines.*

An address delivered at Clark University during the Conference upon
the Far East.

When an invitation was received from Clark University to present some notes on the progress of public works in the Philippine Islands the task appeared easy to accomplish.

The first difficulty encountered, however, was the fact that few general statements hold true throughout the Islands. The numerous dialects and customs, the separation of the people by natural barriers, the lack of inland communication, and the absence of a previous form of government which tended to unite the people, readily account for these variations and may explain seeming contradictions. The second difficulty was the selection and extent of detail of such public works as would clearly show the nature of the work accomplished, the conditions encountered and the progress made in promoting the prosperity of the Islands, and the welfare of the people.

I shall assume that the members of this conference are familiar with those remarkable instructions of President McKinley to the military commander and to the first and second commissions, with the first work of the Philippine Commission and the transfer of military control over the provinces to the civil government during the years 1901 and 1902, with the creation of the legislative, judicial and executive departments, with the enactment of municipal and provincial laws and with the creation as necessity arose of the various government bureaus.

The chronological development of the bureau of public works follows. The provincial government act dated February 6, 1901, provided as one of the three members of the

provincial board a supervisor who was required to be a civil engineer, and who was responsible for provincial public works and also for numerous non-technical branches of provincial administration.

In August, 1902, the office of consulting engineer to the Philippine Commission was created, under which designation the writer began his work in the Islands. In January, 1903, the bureau of engineering was created, providing for a small technical and clerical force, and the supervision of provincial public works was placed under this bureau. In the latter part of 1905, the office of supervisor was abolished, and that of district engineer created, partly to reduce provincial expenditures and partly because the provinces had no funds for public works, but mainly to centralize the engineering problems of the government. At the same time the bureau of engineering was reorganized and designated the bureau of public works, and the title of consulting engineer was changed to director of public works. To-day about one hundred engineers including a few of the returning Filipino students are engaged in the bureau.

The Islands are divided into some thirty-seven provinces, in five of which the non-Christian or semi-savage tribes predominate. The remaining thirty-two provinces, averaging over one and one-half million acres each, are divided into twelve engineering districts, the district engineer of each of which is responsible for all of the technical work executed under the direction of the bureau of public works. He is assisted by such assistant engineers, inspectors, clerks, foremen, and laborers as the nature and extent of his work may require.

The principal responsibilities imposed by law upon the bureau of public works relate to survey designs, estimates and specifications for insular, provincial and municipal public works, to the awarding of contracts and the supervision of works thereunder, and to the execution of public works by day labor when contracts are impracticable. These responsibilities do not include the municipal works of the city of Manila, the lighthouses and port works of the bureau of navigation, nor at present the supervision of railways.

The principal sub-divisions of the bureau of public works are the road division, which is charged with the construction of roads and bridges throughout the provinces; the building division, which is charged with repairs, and new construction; the provincial division, which includes the district engineers and their works; the bridge division, which prepares all designs; the irrigation division and the divisions of artesian wells, of drafting, of property, of records and of accounts. From small appropriations in 1903, this bureau became responsible during the fiscal year 1908 for the expenditure of appropriations aggregating nearly one-third of the total revenues of the insular government. Its technical forces had been increased some thirty fold, and the technical works of the provinces were centralized. The bureau was carrying out policies relative to roads, bridges, buildings, artesian wells, and irrigation as aggressively as conditions permitted.

The status of public works prior to American occupation was deplorable. While the Spanish engineers accomplished some excellent work in the Islands they have been credited with a few results which exist only on paper. The most notable public works of Spanish days are the walls of the city of Manila, the massive masonry churches throughout the Islands, the irrigation systems on a few of the friar land estates near Manila, some bridges of masonry or steel and the fortifications of a few of the principal cities.

The remains of some sections of well constructed roadways can be found, but no evidence exists of any continuous highways serving the agricultural interests of the islands. In a consular report on the condition of the highways in 1898 the American Consul stated that the roads and streets of the Philippine Islands served only as

an illustration of the sad demoralizing effect of neglect and indifference. There is not a single driveway beyond the city limits of Manila, Iloilo or Cebu, nor a roadway which will allow the passage of a four-wheeled vehicle with any degree of comfort to its passengers or of safety to its integrity . . . No attempt is ever made to haul the produce of the provinces over these wretched roads and all that reaches the cities comes by water . . . The country is traversed by numerous foot paths over which the natives

carry produce on their shoulders or heads. The major portion of the archipelago is practically an undeveloped wilderness.

A brief account follows of the geography, meteorology, people, and material which are important in a consideration of the progress of public works.

Disregarding treaty boundaries, the location of the Islands is between the meridians 117 degrees and 127 degrees east longitude and the parallel 5 degrees and 21 degrees north latitude. Officially the total number of Islands is 3141 and the total land area is 115,026 square miles. The two largest islands Luzon and Mindanao, contain 40,969 and 36,292 square miles, respectively. These islands, together with Samar, Palawan, Negros, Panay, Mindoro, Leyte, Cebu, Masbate, and Bohol contain 106,823 square miles. For all practical purposes these eleven islands constitute the Philippine Archipelago. The entire land area of the islands is fourteen times as large as Massachusetts. It is almost as large as the combined area of Massachusetts, Connecticut, New Jersey, New York, and Pennsylvania. The density of the population of the entire Islands is about two and six-tenths that of the United States, but only one fifth that of Massachusetts. This comparison is, however, somewhat misleading, as the axial mountainous central portion of Cebu comprises a considerable area which is sparsely populated. There are no large cities, and actual density of the rural population greatly exceeds that of Massachusetts.

There are two seasons, the dry, occurring during the first half of the year, and the wet, during the latter half. The cooler winter months are sometimes classed as a third season. The average rainfall in Manila is about seventy-five inches per annum, and in the mountainous region it may be two or three times this amount. Typhoons are coincident with the rainy season. These storms extend over an area of from 100 to 300 miles in width; the cyclonic center moves usually at a rate of 10 to 15 miles per hour, but the wind velocity within thirty, forty or even 100 miles of the center may be high and destructive both to structures and to growing crops. The elevation of the rainladen clouds over the moun-

tain ranges occasions intense precipitation over a large area. The rainfall under these conditions frequently may amount to one or two feet within two or three days, and it sometimes averages an inch an hour for an entire day. The result is a dangerous flood throughout the tributary and trunk system of drainage areas. They are the cause of serious difficulties to the engineers engaged in construction work, to a degree unequaled in any other oriental country.

The existence of the severe wet and dry seasons for a period of six months each requires a type of construction which shall withstand successfully both extremes. This applies with special force to road work, the greater portion of which is located on costal and alluvial plains where the soil under continued saturation becomes almost incapable of supporting any load.

It is important that engineers and contractors provide for inland transportation of material on account of the ravages of surra and rinderpest which have seriously decreased the supply of draft animals. Epidemics of small-pox and cholera have been destructive to labor organizations in the past, and their recurrence must be occasionally expected. These diseases have been so successfully combatted by the Board of Health that future difficulties therefrom cannot be regarded as more serious than those presented by the epidemics of this country. The prevalance of malaria in the low-lands, where the greater portion of construction works is executed has been and will continue to be a source of expense and delay to all public works construction.

The labor condition in the Islands is unsatisfactory and a full discussion of the problem is impossible within the scope of this paper. Practically all unskilled labor is furnished by that great mass of illiterate Malays, whose welfare is the special problem of our government. They are exceptionally temperate, but indolent, unreliable, and inveterate gamblers. They are easily lead by vicious demagogues, who fatten on false patriotism and are greedy for personal power, but they are as easily influenced towards good citizenship by those in whom they have confidence and who are familiar with their customs. They love music and their

homes, and are childlike in their anger and affection. Improvement in these traits requires a modification of traditions, customs, and language, and is not possible within one generation. There is no predominating middle class. Conditions tending to create small freeholders, to increase literacy, and to establish such a class, are now working with tangible, favorable results. The pernicious influence of the "cacique," that tyrant of hamlet and village without whose consent purchases cannot be made nor labor hired, is being slowly but surely destroyed.

The Visayans, Tagalogs, Ilocanos, and Bicol, form 46.8, 21.2, 11.7, and 8.2 per cent, respectively, of the total civilized population; unfortunately all of these tribes differ in speech, each having its local dialect. Until recently they were entirely unacquainted with the more permanent type of construction and the ordinary tools used by Americans. Their principal occupation is agriculture, and the universal tool is the "bolo". The plow, a pointed stick, sometimes capped with iron, and guided by a single handle, moves the dirt to a depth of three or four inches but does not turn a furrow. The bolo, plow, and mattock, are the principal tools of the farmer. Rice is the staple food and it is cultivated throughout the Islands, but to a limited degree where hemp, sugar, tobacco, cocoanuts and other valuable crops have been developed. The observer of rice cultivation and harvest and hemp stripping will not question the capability of the Filipino to labor. He is especially apt where deftness of hand is required, as in drafting and typewriting, and is quick to learn to operate machines.

The motormen of the Manila Street Railway, the most of the chauffeurs, the engine drivers of the railway and of the coastwise vessels, are Filipinos. They are not efficient in lines requiring independent action and personal responsibility. Their work along these lines requires competent supervision based upon a knowledge of their character and local dialect. The engineer or contractor who cannot or will not learn this lesson of supervision cannot succeed in handling Filipino laborers. In order to retain the laborers and their families for a reasonable period of time in regions sparsely inhabited

and where large forces are required, it is necessary to construct shelters, a hospital, a commissary provided with food, clothing and cigarettes, and also to furnish recreation and perhaps establish a church and school.

Height and weight are suggestive of physical power. The average of several hundred measurements of matured men gives a height of five feet 3.5 inches and a weight of 116 pounds. The average efficiency of labor as compared with American labor is about one-third, ranging from a high average where quickness and deftness are required to about one-sixth where physical strength and weight are necessary. Experiments made by the army indicate that an increased efficiency can be attained by substituting nitrogenous foods for the prevailing characteristic diet of rice and dried fish. As compared with other oriental countries the wages of the Filipino laborer is high. Under American supervision the Filipino is beginning to understand the meaning of "dignity of labor," a term unknown under compulsory labor systems, and where no necessity exists for providing food for the months of winter, and where the needs of shelter and clothing are so slight.

The Islands throughout the densely populated areas are lacking in building stone. Very few good quarries have been found and developed. Coral rock is plentiful along the coast, from which the natives produce an excellent lime. The manufacture of an inferior brick is common. High grade timber is available only in limited quantities and it is expensive; cheap grades are used only in the construction of temporary works on account of the destructive action of the white ant. Sand and river gravel are fairly well distributed and reasonable in cost. Coal is expensive. It is found in many localities and it is now mined to a limited but increasing extent. Materials for the manufacture of Portland cement are so conveniently located in certain parts of the Islands that its manufacture by private parties may be anticipated within a few years, in lieu of which the government would be justified in its production. It is now purchased at a high price from outside markets.

But few efficient contractors are located in the Islands.

Contracts have been entered into with American, Filipino, Chinese, and Japanese firms. It has been the policy to encourage contractors to enter the field and to foster competition. The supervision required with inexperienced contractors has placed heavy responsibilities upon the bureau of public works. All construction work has been rush work. Contractors' plants are not available in the Manila markets. The supply of small tools was frequently insufficient to equip the labor forces. Salaries have been too small to secure the required number of experienced technical men. Valuable time has been required to impart from the States the desired material and supervising forces, and exceptionally heavy responsibilities have been placed upon the engineer in the field. Efficient foremen were lacking; the pick was prone to break the foot of the man who drove it, and the wheelbarrow was awkward to carry on the head. It has been necessary for the engineer to learn a new language and to be an instructor in the use of new tools and methods. The co-operation of all interested officials has been necessary to overcome adverse conditions, and where that coöperation is lacking the difficulties are almost insurmountable.

The principal public works accomplished during the past decade, or now in progress under the direction of the bureau of public works, are the construction of roads and bridges and the development of an active, aggressive, good road policy; the construction of public buildings for official quarters, barracks, schools, prisons, and hospitals for the central, the provincial and the municipal governments; the creation of an irrigation policy and the general improvement of public works throughout the province.

A brief description of some of these works follows, together with a description of various other important works, the direction of which was not under the bureau of public works.

The visitor familiar with old Manila will be impressed first with the harbor improvements which have been completed practically along lines proposed several years ago by Spanish engineers. Manila Bay is some 25 miles in diameter. The Pasig river flowing through the city of Manila is one of its largest tributaries. The formation is deltaic and the great

depth of soft silt complicates the construction of foundations. The break-water encloses an area of some 350 acres, in which vessels of about 25 feet draft may enter and have protection against typhoons. It constitutes a real harbor of refuge. It has three steel piers and others will be constructed as needed. The construction of this harbor including the reclamation of some 200 acres of bay front will be available for government and private warehouses in a city where nearly all desirable sites were owned or occupied by foreign firms.

The central location of Manila as a distributary point to Japan, China, the Strait Settlements, East India, and Australia, affords great possibilities for future development. The importance of Hong-Kong is well known. Is it a dream to say that with the improvements completed and proposed in Manila harbor she will in time, under liberal shipping regulations, equal and ultimately outstrip her rival?

The next important ports in the Islands are those of Cebu and Iloilo, whose harbors have been improved whereby these centers for hemp and sugar can load at their wharves ocean going vessels. The cost of these harbor works aggregates about \$4,000,000.

An ice plant costing about \$1,000,000, and of a capacity sufficient to meet the needs of the city, was built by the navy during the early days of the war.

Two bridges crossed the Pasig river, one of which was a narrow toll bridge, operated by a private company. The other, the Bridge of Spain, has been widened; two new steel bridges have been built, and the need of the third is claiming attention.

The Manila Street Railway, consisting of about forty miles of track, has replaced the impossible horse trams of earlier days. This road was financed and built by an American company and opened in 1905. It is now operated by Filipinos under American supervision and is a striking object lesson of what efficient supervision can accomplish with Filipino laborers. The cost of this system was approximately \$5,000,000. This electric road has opened up desirable building sites and is reducing excessive rentals which have heretofore prevailed.

The city of Manila was in a very unsanitary condition. The municipal council started investigation, and projects were prepared for extensive improvements in the water supply and for the construction of a new separate sewer system. The intake on the Mariquina River was below a thickly populated area. The water was polluted and deficient in quality. The new water works system was completed sufficiently to be opened in November, 1908. The new water supply is also derived from the Mariquina River, the dam being located above populated areas about 20 miles from Manila in a picturesque gorge at the foot of the mountain. The watershed area, comprising 140 square miles, has been set aside as a reservation and contains no settlement. Some stone drains for surface water existed in Manila but no sewers. The new separate system is now practically completed. The cost of house connection is covered by current revenues. These improvements paid by a guaranteed bond issue of \$4,000,000, placed Manila in a sanitary condition unsurpassed by any other city in the Orient.

Utilitarians demand the removal of the city walls, the filling of the moat and the utilization of this area for various building purposes. Fortunately their arguments failed, the walls remain as a historical monument, unique and of much interest. The moat has been filled for sanitary reasons and its area and the glacis are being converted into parks and play grounds. This area, with the famous Luneta and some 30 acres of reclaimed ground, together with the present botanical gardens, furnishes a valuable park system through the heart of that portion of the city south of the Pasig. Similar extensive parks on the north side have been discussed, and will doubtless be constructed as soon as funds can be secured.

Suitable hotel accommodations have been lacking, but private parties are providing this need so important to the traveling public and the temporary resident. Near the Luneta is Camp Wallace, and its area will contain the future groups of government buildings. The beautifying of Manila will require years to complete. It is advancing practically along the stately lines laid out by Mr. Burnham.

Relative to the construction of school buildings, the following statement is taken from the message of the Governor General to the Philippine Islands for the year 1907:

From insular funds and contributions of the people twenty-four high schools, twenty trade and two intermediate school buildings, all of strong materials, have been constructed. The insular schools are housed in thirteen buildings and intermediate and secondary schools in forty-nine buildings. Three hundred and forty buildings of strong material, two thousand four hundred and ninety-five of mixed material, and four hundred and ninety-three of light material furnished accommodations to the municipal schools. Nearly all of these buildings have been constructed since American occupation.

During the fiscal year 1908, the building division completed 1223 projects at a total cost of \$533,674. Eight trade, intermediate or high schools, a market, an official residence in Baguio, a hacienda building on one of the Friar land estates, and two constabulary buildings were completed, and seven buildings extensively repaired at an aggregate cost of \$163,385. Five provincial buildings, seven trade and high schools, two constabulary barracks, and three buildings for various purposes, aggregating a cost of \$367,200.00 were under contract and 61 per cent completed. Eleven buildings, including one provincial building, two hospitals, three constabulary barracks, and four school buildings were under construction by day labor and two thirds completed. The aggregate cost of these eleven buildings was \$151,700. Plans had been received from the consulting architect, many of which were under advertisement for twenty-three buildings, the aggregate appropriation for which was \$653,000. Of the seventeen school buildings included in the number five were trade schools and one an agricultural school building. The most important of this group of buildings was the General Hospital in Manila, for which including a medical school the appropriation was \$515,000. These buildings are now under construction. They are located near the government laboratories and the weather bureau. The latter was established some fifty years ago under the Jesuit Fathers, and has rendered service of enormous value to the maritime interests of the Islands. This group of buildings will probably be completed

within a few months and will form a scientific center superior to any now existing in the orient. All of the new construction is of strong material either fireproof or of slow combustion. Reinforced concrete is used extensively.

The rainfall of the Islands is ample, but its distribution does not at all times meet the needs of agriculture. Rice, which is the principal food staple, requires double the amount of water of other crops. From time immemorial the Filipinos have leveled the land and conserved the rainfall by means of small embankments. The semi-civilized Igorote has terraced the mountain sides in a remarkable manner. The friars during the last century constructed on some of their estates irrigation systems of considerable extent. The lack of water on non-irrigated land at critical periods of cultivation has resulted in a failure or a short crop about two years out of five. These conditions have been understood, but the small revenues and the demand for funds along lines of more immediate importance have limited expenditures to the restoration and maintainance of the few existing systems on the Friar lands, which, to avoid agrarian difficulties, had been purchased by the government. In 1907 the first appropriations for general irrigation were secured, for the construction and maintainance of irrigation systems in the provinces. The law requires that this appropriation shall be reimbursable by owners of the lands benefited.

In 1908 two additional appropriations were granted. These conditions made it possible for the secretary of commerce and police to outline an irrigation policy and to authorize the organization of the necessary force for investigation and surveys.

Proposed irrigation laws have been drafted and are now under consideration. Much aggressive effective educational work has been in progress. Numerous preliminary investigations have been made. River hydraulic data are being collected. In the latter part of 1908 a corps of about twenty engineers had been secured for this work. Eleven important projects had been selected, detailed surveys authorized and practically completed. These eleven projects comprise about 180,000 acres of irrigable land. The cost of construction

will approach two million dollars. The successful inauguration of this irrigation work with annual reimbursable appropriations will provide, when reimbursements become normal, nearly one million dollars, and it should through its operations furnish direct practical means for the improvement of agricultural methods and the selection of the most profitable products. It will make possible the production annually of two or three crops in some localities, insure a fair yield over all the areas concerned, and tend towards a general development throughout the Islands of agriculture upon which the prosperity of the people depends. A few years ago it was necessary to import rice to the amount of twelve million dollars. This useless drain should not occur, but rather, with a reasonable improvement of agriculture, with the restoration of draft animals and especially with the development of the thrift and industry of the people, the Islands should become exporters of rice and other food products.

A work of large importance to the health of the people is that of securing potable water. Outside of Manila the main source of supply is the subsoil water which is reached by means of large shallow and unprotected wells. Excepting malaria the most serious diseases are intestinal, and these shallow polluted surface wells form a most efficient method of retaining and spreading them throughout a community. Artesian wells and also driven wells, where their use is possible, have also been provided for by a reimbursable appropriation.

In 1908 a further appropriation of \$75,000.00 was made. These appropriations are augmented by contributions from the local governments. The first deep-well outfit was received in August, 1904, the second in September, 1907, and the third in May, 1908. Three deepwell outfits and several small jet rigs have been in operation the past year. Chemical and bacteriological tests are made before the well is turned over to the community. Up to June 30, 1908, 28 wells averaging nearly 300 feet in depth had been drilled. In some communities the death rate has been reduced 50 per cent since pure water became available.

The Manila Railway Company, an English company, had constructed and was operating 120 miles of railway at the time of American occupation. Provisions have been made for a bond issue to the amount of \$30,000. Some 750 miles of new road have been authorized, on 300 miles of which no interest has been guaranteed. These lines must be completed in 1913. Probably 200 miles of these new railroads have already been opened to the public. One of these lines leads from Dagupan, the terminus of the old railroad, to the foothills of the Benguet mountains, from which point the Benguet highway leads to the Baguio plateaus, whose elevation is about 5,000 feet. The highway, 20 miles in length, follows the Bued river, through canyon and forest and along precipitious cliffs and steep slopes, presenting varying pictures of tropical vegetation and rugged mountains up to the tree ferns and pine-clad hills of Baguio. Here are located in an almost temperate climate an extensive military camp with its commodious hospital, a well equipped civil hospital and a naval reservation, while the construction of another hospital is proposed. Here are the summer homes of government officials, several business houses and many private residences. The general plans for the development of this beautiful, healthful region were also made by Mr. Burnham, and the work accomplished from year to year is in accordance with his general ideas. The results in time will be a health resort of exceptional beauty and advantage to the people directing the governmental and commercial affairs of the Islands.

The development of coastwise transportation and of railroads connecting the centers of trade, distributing commodities and produce at moderate rates, are of large value, but the construction of the highways of the island whereby the interior areas can be served is of far greater importance to the development of an agricultural country. It is a notable fact that the first act of the commission dated September 12, 1900, appropriated \$1,000,000 for roads. This fund was expended almost entirely under the direction of the military authorities mainly upon roads in the vicinity of army posts, and when their upkeep fell on the local government the

advantages of this expenditure disappeared. The civil government also made various appropriations for roads aggregating some 500 miles in length, only a few of which were located through a developed region. While the local government sought appropriation for road construction and accepted responsibility for their maintenance, funds as well as public spirit were lacking and neither new nor old roads were properly maintained. The need of creating sources of revenue and of arousing in local governments greater interest in these highways by placing upon them an equitable portion of their cost became evident.

The first aggressive enactment in the development of the present road policy was the Philippine Road Law of 1906. This law provided a tax of five days labor or a payment in cash of its equitable commutation. It was an optional law to the extent that it was not to be effective in any province until it had been adopted by a majority vote of municipal presidents and councilors of said province. These elective officials uniformly declined to adopt the provisions of this law.

In 1907 a double cedula law was enacted, also optional to the extent that it was to be adopted by the provincial boards. The double cedula or per capita tax applies to about one and one-half million persons. The increase in the tax was to be expended only on roads and bridges and aggregated about \$750,000.

The internal revenue laws were amended granting about \$375,000 to the road and bridge funds of the province and half as much for schools, provided the conditions of the double cedula law were adopted. The general appropriation act for the fiscal year 1907-08 included an item of \$250,000 for the "construction, improvement, and, when necessary, for the maintenance of roads and bridges in the provinces, to be allotted in the discretion of the secretary of commerce and police," and the road and bridge fund from the usual provincial sources aggregate about half a million more.

The two elective members of the board hesitated on account of political reasons to act. The people, however, had been accustomed to a cedula tax and raised no serious ob-

jection. A vigorous educational work regarding the importance of good highways was fruitful. Only four provincial boards failed to adopt the double cedula law in 1907-08. The general appropriation bill for 1908-9 carried \$500,000 for the same purposes, and subject to the same conditions, and all but one of the provinces accepted the double cedula for that year. The annual aggregate of these conditional funds and the ordinary road and bridge funds of the provinces gives a total of over \$2,000,000 for the year 1908-9. The work accomplished during the previous year had made the scheme popular to an exceptional degree; the native officials and the people began to perceive the integrity of the American officials. These events made it possible for the secretary of commerce and police to authorize a road policy which equals the good roads policies of our foremost States. Maintenance of existing roads, the repair and reconstruction of existing structures and the construction of new roads only in a first class manner are the essential items in order of importance for which the allotment funds were available.

The value of this road policy to the material development of agricultural lands and the reduction of cost in the marketing of goods can hardly be overestimated. Agriculture is the real wealth of the Islands and its condition presents a true measure of the prosperity of the country, and the industry of the inhabitants.

The construction and maintenance of these roads and bridges requires the employment of a hundred thousand Filipinos annually, the large proportion of whom live in agricultural regions. They will become familiar with modern tools and methods of work and to a considerable degree will apply this knowledge to farm work, thereby incidentally making a market for American tools but materially increasing agricultural outputs. The total cost of the conversion of these roads and bridges to permanent types will be some 25 or 30 million dollars, and their annual maintenance will approach \$3,000,000. While these figures represent the large outlays the advantages derived to the prosperity of the country will be manifold.

The American government found a Malay people the

great mass of whom did not know the value of thrift, of providing for themselves sustenance and shelter during the ice-bound months of a northern winter, and in whom any desire to provide for a rainy day or old age or sickness had been stifled through the danger of loss by robbery, by greed and graft, and who had never realized that a public office was a public trust. These people are learning that taxation furnishes a fund which is returning to them in increased facilities for transportation, in buildings for market, public offices, jails for the protection of society, and for schools for all classes. In the construction of schools they have shown a most commendable spirit. Contributions from rich and poor in money, material and service have been added to government funds to produce a better or larger building, or for a school house when no government funds were available. It may be that this public spirit has been fostered by the idea that ability to read and write meant national independence. No matter what the cause, the aggregate result of these lessons is developing individual independence and real patriotism. It will direct the people to a consideration of sanitation, justice and other public questions. It foretells the overthrow of caciquism and grafting.

The men who have secured results and advanced the welfare of the provinces merit a tribute. To the field engineer, the district engineer and his assistants much credit is due. His work has been educational in the highest sense. He has contended with jungle, storm, and epidemics. He has shown a high degree of courage, efficiency and integrity. He has adapted himself to strange conditions. He has been an example of Americanism throughout the Islands. He has come in closer contact with the large masses of the people than perhaps any other American official. His work has been "rush" throughout the year without the relief furnished by the frost of winter. He has been required to lay aside his note-books based on former practice and to learn the value of new materials and a strange dialect.

Sir James Strachey states in reference to the stupendous irrigation works in India that: "no similar works in other countries approach in magnitude the irrigation works of

India, and no public works of nobler utility have been undertaken in the world." While in magnitude our public works in the Philippines are exceeded by those in India, they stand foremost in advancing the civilization of the masses. That remarkable policy of the American government towards the Philippines was enunciated by our lamented McKinley, and it has been vigorously advanced by our President. I cannot help believing that these practical utilitarian works by the engineer are powerful instruments useful in the attainment of a true sense of liberty among the great masses in the development of our dependencies and their people, and in the realization of the American Colonial policy.